CALIFORNIA STATE SCIENCE FAIR
2015 PROJECT SUMMARY

Name(s)
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Project Number
35016

Project Title
The Effect of Electricity on Bacterial Growth

Abstract

Objectives/Goals
With the overuse of antibiotics, bacteria have developed resistance. Electricity might be useful in inhibiting bacterial growth.

Methods/Materials
Initial Bacterial Growth Test: 1.Prepare incubator. 2.Prepare nutrient broth. Put bacteria from your arm in broth. 3.Prepare three 18, 9, and 3V battery packs. 4.Take 12 agar plates. Take 10 µL of broth and plate it. 5.Heat up a steel pin. Push into the back of an agar plate and pull it out. Push next pin into agar 30 mm from the other pin. Pull it out. Repeat on all plates. 6.Hot glue battery packs onto plates. Put steel pins into plates. Make control plates by only putting steel pins into plates. 7.Connect battery packs to pins. Incubate for 24 hours. 8.Turn off electricity. Plate 2 µL of broth on zones of inhibition. Incubate for 24 hours. 9.Rub Ph strips on zones of inhibition. 10. Repeat 1-7 with graphite instead of steel pins.

Results
Anodes had circular orange zones of inhibition around them while cathodes had circular clear ones. The average diameter of the zones of inhibition for the anode on the 18, 9, and 3 volt plates was 13.7, 14.0, and 15.0 mm. The average diameter of the zone of inhibition for the cathode on the 18, 9, and 3 volt plates was 9.7, 8.7, and 9.3 mm. Also, despite no change in pH, bacteria would not regrow on zones of inhibition. In the graphite test, the only thing that was different was that there was no orange color.

Conclusions/Discussion
I hypothesized that voltage would inhibit bacterial growth. This is incorrect. The electricity may have created anti-bacterial compounds. These compounds would be neutrally charged because there were perfect circles around the anode and cathode.
I thought that the electricity was making rust. Electricity will split water into hydrogen (H(+)) and hydroxide (OH(-)). The hydroxide could have gone to the positively charged anode and formed rust (Fe(OH)(3)). Rust has a neutral charge.
I believe that hydrogen peroxide was forming at the cathode. During the electrolysis of water, hydrogen could have formed. It would have gone to the cathode. The hydrogen ions may have reacted with oxygen in the air, making hydrogen peroxide(H(2)O(2)).
Another molecule that may have separated was the sodium chloride (NaCl) molecules in agar. Chlorine dioxide (ClO(2)) could have formed at the anode. Sodium from the salt could have moved to the cathode. It would have had no effect.

Summary Statement
I wanted to find out how electricity effected bacterial growth.

Help Received
Parents proof read poster. Dad helped solder electrical circits together. Dad taught me about electrical circits. Parents purchased materials